Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII EXAMINATION – SUMMER 2025

Subject Code:3170924 Date:21-05-2025

Subject Name:AI and Machine Learning

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Describe the key goals and objectives of Artificial Intelligence. How is AI shaping the future?	**03**
	(b)	Give a brief overview of the history of Artificial Intelligence, highlighting significant milestones.	**04**
	(c)	Discuss the similarities and differences between human intelligence and artificial intelligence in terms of learning and decision-making.	**07**
Q.2	**(a)**	Describe the biological neuron and explain its key functions.	**03**
	(b)	Explain the fundamental structure of an Artificial Neural Network (ANN) and provide a clear diagram to support your explanation.	**04**
	(c)	Why is the activation function important in neural networks? Discuss the various types of activation functions used in feedforward networks.	**07**
		OR	
	(c)	Demonstrate the different types of learning methods used in neural networks, providing examples where applicable.	**07**
Q.3	**(a)**	What is dimensionality reduction in machine learning? Explain its importance.	**03**
	(b)	Define feature selection in machine learning and outline the key steps involved in the process.	**04**
	(c)	Compare and contrast simple linear regression and multiple linear regression methods used for predicting output.	**07**
		OR	
Q.3	**(a)**	What are decision trees in machine learning? Define and explain the concepts of decision nodes and leaf nodes	**03**
	(b)	Explain collaborative filtering and discuss its role in recommender systems.	**04**
	(c)	Provide a brief description of the K-Nearest Neighbors (KNN) algorithm and how it functions.	**07**
Q.4	**(a)**	Is clustering a supervised or unsupervised learning method? Explain with a relevant example	**03**

	(b)	Differentiate between machine learning and deep learning.	**04**
	(c)	Provide a brief explanation of agglomerative hierarchical clustering.	**07**

OR

Q.4	**(a)**	Explain the selection operator in a genetic algorithm.	**03**
	(b)	Describe any one crossover technique used in genetic algorithms with an example.	**04**
	(c)	Using a flowchart, explain the concept of a genetic algorithm and the importance of mutation and crossover.	**07**

Q.5	**(a)**	Describe the concepts of hyperplanes, support vectors, and the kernel trick in Support Vector Machines (SVM).	**03**
	(b)	Explain the basic concept of Support Vector Machines (SVM) in machine learning.	**04**
	(c)	Describe the Logistic Regression approach in machine learning. Is it a classification or regression technique?	**07**

OR

Q.5	**(a)**	What are the benefits and limitations of a fuzzy logic system?	**03**
	(b)	Using the Centre of Area Defuzzification method, find the crisp outputs Y1 and Y2 for the given membership functions, assuming X1 = X2 = 4. $\mu(X_1) = \left\{\frac{0.3}{0}, \frac{0.6}{2}, \frac{1}{4}, \frac{1}{6}, \frac{0.6}{8}, \frac{0.3}{10}\right\}$ $\mu(X_2) = \left\{\frac{0.3}{0}, \frac{0.6}{2}, \frac{0.6}{4}, \frac{0.6}{6}, \frac{0.6}{8}, \frac{0.3}{10}\right\}$	**04**
	(c)	Briefly explain the various types of membership functions used in fuzzy systems. Discuss any three membership functions in detail.	**07**